Predicting teachers' use of digital learning materials: combining self-determination theory and the integrative model of behaviour prediction

Predicting Teachers' use of Digital Learning Materials: Combining Self-Determination Theory and the Integrative Model of Behavior Prediction

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Abstract

In this article, we report on a study that investigated the motivational (e.g., intrinsic motivation) and dispositional variables (e.g., attitudes) that determine teachers' intention to use or not to use Digital Learning Materials (DLMs). To understand the direct and indirect relationships between these variables we replicated a study of Hagger *et al*. (2006) in which Self-Determination Theory (SDT) and the Theory of Planned Behavior (TBP)/Integrated Model of Behavior Prediction (IMBP) are combined according Vallerand's (1997) proposal to distinguish between global level psychological needs, contextual-level and situational-level motivational constructs. Using a sample of 1273 teachers, our preliminary findings supported the findings of Hagger *et al.* (ibid). The combined model of Hagger *et al*. (ibid) potentially provides us with a more comprehensive explanation of teachers' volitional behavior regarding their *use* of DLMs in their pedagogical practices than would be possible on the bases of SDT or IMBP alone.

Keywords: Digital Learning Materials, Self-Determination Theory, Integrative Model of Behavior Prediction, Teachers.

Introduction

The Dutch ministry of Education, Culture and Science recently launched the Wikiwijs initiative to promote the use, development, and sharing of Digital Learning Materials (DLMs) by teachers (Plasterk 2009). Wikiwijs is nothing more than a repository in which various DLMs are stored and that can be accessed by the public and, thus, also by teachers. Recent and previous research on Information and Communication Technologies (ICT) usage in education, however, revealed that, in general, teachers are more often reluctant rather than willing to use ICT in their pedagogical practices (Ward 2005, Yang & Huang 2008). It is possible that the same is true regarding the use of DLMs. Therefore, the question arises whether such singular initiative as Wikiwijs – as an intervention – is sufficient enough to promote teachers' use of DLMs. It is not unlikely that additional measures have to be taken for making Wikiwijs a complete success. The same recent and previous research also revealed that the availability and accessibility of a well-equipped ICT infrastructure in schools and teachers' possession of the necessary instrumental and pedagogical knowledge and skills to use ICT in classes do not guarantee the actual use of ICT (Cuban 2001, Ward ibid). It seems that the availability and accessibility of Wikiwijs is meeting a similar fate: necessary but not sufficient to guarantee DLMs usage. Therefore, it is important to elicit those underlying variables that are responsible for this phenomenon of not using DLMs despite the accessibility and well equipped infrastructure of Wikiwijs.

One model that may help to get insight in those variables is the Integrative Model of Behavior Prediction (IMBP; Fishbein 2000) that is largely based on the Theory of Planned Behavior (TPB; Ajzen 1991, Fishbein & Ajzen 2010). IMBP has a wide spread use in social psychology, in particular in the specific domain of health care and health promotion (e.g., Yzer *et al*. 2004). In IMBP it is assumed that the dispositional variables attitude, perceived norm, and self-efficacy directly determines teachers' behavioral intention to use DLMs in classes. Intention,

in turn, is a direct predictor of actual behavior. Another model is Self-Determination Theory (SDT; Deci & Ryan 1985, 2000, 2008). SDT purport that the satisfaction of three psychological needs is conditional for teachers' motivation to use DLMs. These three needs are feelings of competence, relatedness, and autonomy. The type of motivation that is developed is self-determined versus controlled and even may be intrinsic. Intrinsic motivation refers to the state in which teachers use DLMs just for fun and pleasure.

According to Hagger and Chatzisarantis (2009), SDT and TPB, and, thus, also IMBP, have their weak and strong points regarding their predictive power with respect to the desired behavior. They stated about the weak points that "SDT does not chart the exact process by which motivational orientations are converted into intentions and behaviour and the TPB has provided an effective basis for the explanation of variance in intentions and [...] behaviour without identifying the origins of the antecedents of the behaviour" (p. 276). The strong point is that both theories can be combined in which they complement each other; Hagger and Chatzisarantis (ibid) stated that "[t]he basis for integration is offered by Deci and Ryan (ibid) and Vallerand (1997) who state that motivational theories can offer explanations for the origins of social cognitive beliefs and expectations outlined in models of intention like the TPB" (p. 276).

In this article, we report on our study that replicated a study of Hagger *et al.* (2006) in which Self-Determination Theory (SDT) and the Theory of Planned Behavior (TBP) are combined according Vallerand's (1997) proposal to distinguish between global level psychological needs, contextual-level and situational-level motivational constructs. In our study, however, we substituted TPB with the Integrative Model of Behavior Prediction (IMBP) which is – as we already pointed out – largely based on TPB. Also, Hagger *et al.* (ibid) performed their study in the health domain (exercise and dieting) whereas we performed our study in the domain for the advancement of the integration of ICT in teachers' pedagogical practices (in particular, DLMs usage).

Opmerking [KK1]: Uitschrijven: Hagger, Chatzisarantis, and Harris ??

We first start with our theoretical framework in which IMBP and SDT are described. We hypothesize that Hagger's *et al.* (ibid) proposed combined model is applicable as a model to

explain the motivation sequence regarding DLMs usage by teachers. We then continue with the method section in which the data collected is analyzed using structural equation modeling (SEM). We present our results followed by a conclusion and discussion section, which also present some guidelines of how to stimulate teachers' use of DLMs any further.

Theoretical framework

In this article we consider three theories and models: 1) the Integrative Model of Behavior Prediction (IMBP; Fishbein ibid), 2) Self-Determination Theory (SDT; Deci & Ryan 2000, 2008; Ryan & Deci 2000), and 3) Vallerand's (ibid) hierarchical model of motivation.

Integrative Model of Behavior Prediction

The first model/theory we describe is the Integrative Model of Behavior Prediction (IMBP; Fishbein ibid). In this model, dispositional variables play a key role in the cognitive process of self-regulation with respect to the desired behavior, here teachers' usage of DLMs in education. According to IMBP, three dispositional variables are the direct antecedents of teachers' intention to use DLMs in their pedagogical practices. These variables are attitude, subjective norm, and self-efficacy towards DLMs use. Intention, in turn, is a predictor of actual usage of DLMs by teachers. The relationship between intention and actual usage of DLMs is not perfect but is supposed to depend on environmental variables that may hinder actual usage (e.g., the non-availability of suitable DLMs) and by teachers' actual knowledge and skills regarding pedagogical DLM use.

Teachers' attitude towards using DLMs can be defined as the overall feeling of sympathy or antipathy towards the consequences or outcomes of using DLMs. Subjective norm towards using DLMs can be defined as a person's aggregated beliefs that most people who are considered important think that he or she should use DLMs. Subjective norm thus reflects a form of social influence which is pressuring (Ajzen ibid, Fishbein & Ajzen ibid). Self-efficacy refers to "people's beliefs about their capabilities to exercise control over their own level of functioning and over

events that affect their lives" (Bandura 1991, p. 257). Self-efficacy with respect to teachers' usage of DLMs, concerns the convictions teachers have that they can actually use DLMs and that they can overcome the impediments that hinder the use of DLMs. Figure 1 displays IMBP adapted for the domain currently under investigation. Kreijns *et al*. (2013) have extensively described IMBP for the current domain. .

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Insert Figure 1 about here

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Self-Determination Theory

Self-Determination Theory (SDT; Deci & Ryan 2000, 2008, Ryan & Deci ibid) posits that three psychological needs are at the energetic basis for self-motivation and personal integration. These basic psychological needs are innate, therefore not learned and are identified as those social environmental conditions that have to be fulfilled. The three basic needs are autonomy, competence, and relatedness. Autonomy is the feeling that one is the origin of one's action which is in harmony with the integrated self. Competence is the feeling that one is effective, and that there are sufficient opportunities to demonstrate efficacy. Relatedness is the feeling that one is connected and valued by others and that one experiences a sense of belonging. If the social environment is not satisfying these basic psychological needs, then negative consequences will become salient with respect to activity and development and thus for human well-being. Indeed, satisfaction of the needs influences not only the amount of motivation but especially which type of motivation regulates the activity. In particular, Deci and Ryan (2008) stated that "[t]he theory focuses on types, rather than just amount, of motivation, paying particular attention to autonomous motivation, controlled motivation, and amotivation as predictors of performance, relational, and well-being outcomes" (p. 182). Autonomous motivation encompasses the preferred types of motivation: intrinsic motivation and two types of extrinsic motivation which are the integrated and identified motivation. Controlled motivation encompasses two other

types of extrinsic motivation: introjected and external motivation. Autonomous motivation is associated with self-determined regulation whereas controlled motivation is associated with coercive regulation (i.e., non-self-determined regulation). Intrinsic motivation is concerned with the active engagement with tasks solely because one finds them interesting and pleasant. Integrated motivation is the type of extrinsic motivation that is the closest to intrinsic motivation; it deals with doing the tasks because the activity reflects aspects of the self. Deci and Ryan (2000) stated: "[w]hen regulations are integrated people will have fully accepted them by bringing them into harmony or coherence with other aspects of their values and identity" (p. 236). Identified motivation is the type of motivation in which humans identify the activity as important and beneficial and, thus, are willing to perform the activity. Introjected motivation represents a regulation that is driven by the feelings of guilt and shame as well as by factors such as self-esteem and ego-involvement. External motivation is the strongest type of extrinsic motivation in that the regulation of the activity is a function of reward or punishment expectations. Finally amotivation, also associated with non-self-determined regulation, is the type of motivation in which one performs the activity but without any intention. The different types of motivation and regulations as well as the locus of causality are depicted in Figure 2, which is adapted from Deci and Ryan (2000, p. 273) to align it with Deci and Ryan (2008).

Opmerking [KK2]: Ibid ????

Opmerking [KK3]: Ibid ????

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Insert Figure 2 about here

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Vallerand's hierarchical model of motivation

Hagger *et al*. (ibid) used Vallerand's (ibid) hierarchical model as a framework to "model the processes by which the satisfaction of psychological needs from self-determination theory determine contextual-level motivation and situational-level intentions and behavior from a social cognitive model of decision making, the theory of planned behavior" (p. 132). Indeed, Vallerand and Ratelle (2002) proposed that psychological needs satisfaction can be considered

as a generalized, trait-like construct at the global level. In the context of our study, the needs at the global level refer to general ICT usage by teachers. For example, teachers may feel related to their colleagues when they support and value them as ICT competent teachers; the colleagues may do so because the teachers were able to demonstrate their competent behavior regarding their use of ICT at various occasions. As psychological needs satisfaction happens at the global level, Hagger *et al*. (ibid) linked these needs with global-level motivation.

In line with Deci and Ryan (2000), Vallerand and Ratelle (ibid) pointed out that to the extent that the psychological needs are satisfied, the types of motivation and regulation will become more autonomous versus controlled (see Figure 2), which is happening at the contextual level. It is therefore that Hagger *et al*. (ibid) also used the term contextual-level motivation for autonomous motivation. At this level, and in contrast to the global level where the motivation refers to general ICT usage, the motivation is narrowed down to the use of any type of (open) DLMs.

The situational level is the level in which motivation is expressed in terms of attitude, subjective norm, self-efficacy, and intention. Hence, Hagger *et al*. (ibid) linked this motivation to situational-level intention. At this level, the specification of DLMs usage is further narrowed and concerns now only the Wikiwijs DLMs. Such narrowed specification of behavior is compliant with the guidelines of Fishbein and Ajzen (ibid) that state that rather than a general behavior (i.e., a contextual level behavior such as general ICT usage) a specific behavior should be the focus of the study (i.e., a situational level behavior such as Wikiwijs DLMs usage). The guidelines further state that the TACT condition needs to be fulfilled. For the TACT condition to hold, the behavior must specify Target, Action, Context and Timing. Here, the Wikiwijs DLMs forms the target and the context is defined by the pedagogical practices of the teachers (in which any form of DLMs possibly is used); action is the use of Wikiwijs DLMs. Finally, the time can be specified by using the term *regularly*, which may be specified as 'a few times a week during the school year.' Indeed, Hagger *et al*. (ibid) pointed out that "[m]otivational constructs at this level reflect an individual's motivation toward a specific behavior in a clearly defined time frame" (p 133).

Figure 3 depicts Hagger's *et al*. model in which SDT and TPB (i.e., IMBP) are combined using Vallerand's hierarchical model of motivation.

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Insert Figure 3 about here
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Research Question

Our study addressed the question whether Hagger's *et al*. model, in which SDT and TPB (i.e., IMBP) are combined using Vallerand's hierarchical model of motivation, will still be valid if this combined model is applied to teachers' use of Wikiwijs DLMs (rather than students performing exercising and dieting behavior). If so, what are the implications for promoting teachers' use of DLMs from the perspective of the combined model?

However, we had the problem that the availability of Wikiwijs (open) DLMs is too low due to the fact that the Wikiwijs initiative was launched only recently with the consequence that the Wikiwijs repository is not yet filled satisfactory to be useful for teachers. Therefore, we decided to answer the question with respect to the use of any DLMs, that is, other sources than the Wikiwijs repository alone could be used by teachers to acquire the DLMs. This change is already reflected in Figure 3. Furthermore, we felt that the global-level needs, that refer to general ICT usage, is too broad as this means that the full spectrum of ICT usage should be considered including the use of an electronic discussion board, the use of an electronic student portfolio, and the use of social software, which all have a 'far' relationship with DLM usage. For that reason we restricted the global-level needs to be associated with general DLMs usage. As a consequence, the distinction between global-level and contextual-level motivation is not a strict one in our study.

Method

Participants

Teachers from primary, secondary and vocational education were contacted through an online panel to participate in this study (N =1273). The distribution of the sample with respect to education type, age and gender is presented in Table 1. Based on information from 2009 (CBS, 2009) deviations from the Dutch teacher population distribution were relatively small.

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Insert Table 1 about here

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Measures

The questionnaire included SDT measures for the basic needs variables (i.e., competence, autonomy, and relatedness) and locus of causality (i.e., amotivation, extrinsic, and intrinsic motivation; extrinsic motivation encompassed the external, introjected, and the identified regulation types) as well as IMBP measures for the dispositional variables (i.e., attitude, subjective norm, self-efficacy, and intention) and a demographics section. The SDT measures for the motivational variables were derived from existing measures and adapted for our purposes. In some cases, new items had to be constructed. For instance, identified regulation is normally associated with reasons that are based on one's own values or goals that are related to the self (e.g., 'Doing the behavior is important to me'), but teachers have classes with pupils and, therefore, values and goals may also be related to the other (e.g., 'Doing the behavior is important for my pupils). The IMBP measures for the dispositional variables were either adapted from existing measures or newly constructed thereby following the guidelines of Fishbein and Ajzen (ibid). That is, we followed their three principles: 1) rather than a general behavior a specific behavior should be the focus; 2) the TACT condition needs to be fulfilled; and 3) the principle of compatibility. The first two principles are already described in this article; the principle of compatibility implies that all items of the different measures should be formulated in a similar way.

Adapting existing measures and adding new items in order to construct appropriate IMBP measures is a normal procedure according to Fishbein and Ajzen (ibid). Indeed, Francis *et al*. (2004) wrote a manual how to do this exactly. Because SDT was combined with IMBP, it was necessary to apply the same three principals, as mentioned above, to the SDT measures.

Competence, autonomy, and relatedness were measured by asking participants to score a number of statements. All statements had the same preamble while the items completed the statement. The preamble, the items for competence (two items), autonomy (three items) and relatedness (three items), as well as their answer categories are depicted in Table 2. With respect to the variables that constitute the locus of causality, only the identified and the intrinsic regulation types were relevant for the present study as we were only interested in self-determined motivation. Participants were asked to score a number of statements; all the statements had the same preamble. Identified regulation regarding the self and the other were each measured with three items. Table 2 depicts the preamble, the respective items, and the answer categories. Our interest to consider self-determined motivation in the contextual level (see Figure 3)was based on Martens' (2009) model that stated that basic needs satisfaction affects the degree of intrinsic motivation, which is the most preferred type of self-determined motivation. However, our decision to use self-determined motivation contrasts the study of Hagger *et al*. (ibid). Inspired by Vallerand and Ratelle (ibid), they calculated a relative autonomy index (RAI) from all the variables that form the locus of causality and used that as the variable of interest at the contextual level.

Attitude towards a behavior (i.e., using DLMs) should reflect an instrumental as well as an affective or experiential dimension (Fishbein & Ajzen ibid). Three bipolar items were used to assess the instrumental dimension and three other items to assess the experiential dimension. For each bipolar item, participants were required to score a 7-point scale (see Table 2). Subjected norm was measured with a single item (see Table 2). Self-efficacy should reflect two dimensions, the capacity and the autonomy dimension (Fishbein & Ajzen ibid). The capacity dimension is concerned with how confident one feels to perform the target behavior; the

autonomy dimension is concerned with the 'locus of control', that is, the degree to which one feels free to decide whether or not to perform the target behavior even if there are barriers. In our study we only assessed the capacity dimension. Table 2 depicts the items of the capacity dimension as well as their answer categories. Intention was measured with four items that are common for the measurement of behavioral intention (see for these items, Fishbein & Ajzen ibid). The intention items and their answer categories are depicted in Table 2.

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Insert Table 2 about here

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Analysis and Results

In our analysis we first used confirmatory factor analysis (CFA) in structured equation modeling (SEM) to test the adequacy of the measurement model. In other words, we tested the hypothesis that for each SDT and IMBP variable the proposed latent factor(s) could explain the covariances amongst its observed items. Our analyses showed that the measurement model was indeed adequate. However, in this article we will not describe these analyses because of space limitations.

Second, we used SEM to test the structural relationships between the latent variables. Figure 3 depicts the path diagram of the Hagger's *et al*. model. According to Byrne (2010) and others (Kline 1998, Hu & Bentler 1999) a Goodness of Fit Index (GFI) and a Comparative Fit Index (CFI) between .9 and 1.0 indicate a good fit. The Root Mean Square of Error of Approximation (RMSEA) should be between the .0 and .8 to indicate a good fit as well. Commonly, the Chi-square test is used to assess model fit. However, the Chi-square test becomes more sensitive as the number of cases increases (Barrett 2007). In this study the number of cases is high and, therefore, the Chi-square test is not used to assess model fit but is merely reported for completeness. Instead, GFI, CFI and RMSEA are used. According to these fit indices Hagger's *et al*. model fitted the data well ($\chi^2(df = 420, N = 1273) = 2037.5, p < .01$; GFI = .90, CFI =

.958. RMSEA = .055). Path analysis using SEM revealed that a considerable part of the variance in intention (R^2 = .29, p < .01) is explained by the dispositional variable attitude (β = .51, p < .01) whereas subjective norm (β = .08, p < .01) and self-efficacy (β = .06, p < .05) almost did not contributed to it.

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Insert Figure 4 about here

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The SEM analysis also revealed that self-determined motivation has a low and non-significant relationship with subjective norm (β = -.05, non-significant). Finally, the SEM analysis revealed that the relationship between psychological needs satisfaction and self-determined motivation is significant (β = .67, p < .01).

Discussion

We now discuss our findings from the Analysis and Results section. The high contribution of attitude to the explanation of the variance in intention is also found by Hagger *et al*. (ibid) in both the exercising and dieting case ($\beta_{exercising}$ = .264, p < .01; $\beta_{dieting}$ = .548, p < .01). The low contribution of subjective norm is also found by Hagger *et al*. (ibid) in the exercising case ($\beta_{exercising}$ = not given, non-significant) but not in the dieting case where the contribution was high ($\beta_{dieting}$ = .207, p < .01). However, the low contribution of self-efficacy (β = .06, p < .05) to the explanation of the variance in intention is somewhat in contrast with the findings of Hagger *et al*. (ibid). They found that perceived behavioral control contributed significantly to the explanation of the variance in intention ($\beta_{exercising}$ = .503, p < .0.1; $\beta_{dieting}$ = .221, p < .0.1). This may be due to the instruments used, a reason for further investigation.

The finding that self-determined motivation has a low and non-significant relationship with subjective norm is in line with the finding of Hagger *et al*. (ibid). They explained their finding as follows: "[s]ubjective norms at the situational level are not expected to mediate the

impact of autonomous motives on intention in accordance with previous findings … .The most likely reason for this [i.e., the low contribution] is that subjective norms reflect controlling, other-referenced beliefs regarding future behavioral engagement rather than personal beliefs" (p. 135). Also in line with the findings of Hagger *et al*. (ibid) were the relationships between self-determination motivation and attitude ($\beta = .75$, $p < .01$; Hagger *at al*. (ibid): $\beta_{exercising} = .314$, $p < .01$; $\beta_{dieting} = .426$, $p < .01$) and between self-determination motivation and self-efficacy ($\beta = .58$, $p < .01$; Hagger at al (ibid): $\beta_{exercising} = .368$, $p < .01$; $\beta_{dieting} = .382$, $p < .01$). The reason why our path-coefficients are higher than those of Hagger *et al*. (ibid) is possibly because we used self-determined motivation instead of the relative autonomy index (RAI).

Finally, the SEM analysis revealed that the relationship between psychological needs satisfaction and self-determined motivation is significant ($\beta = .67$, $p < .01$) which also corresponds with the findings of Hagger *et al*. (ibid) ($\beta_{exercising} = .159$, $p < .01$; $\beta_{dieting} = .405$, $p < .01$). Here too, the reason why our path-coefficients are higher than those of Hagger *et al*. (ibid) is possibly because we used self-determined motivation instead of RAI.

Conclusion

The aim of this study was to answer the question whether Hagger's *et al*. model would still hold if this model is applied to teachers' use of DLMs – the Hagger's *et al*. model combined SDT and TPB (i.e., IMBP) using Vallerand's hierarchical model of motivation. And, if so, what are the implications for promoting teachers' use of DLMs from the perspective of the combined model?

Our preliminary findings thus far supported largely the findings of Hagger *et al*. (ibid). Regarding the relationship of self-efficacy and intention, we note that in our test of the model the path coefficient is significantly lower (however still statistically significant).This may be due to the instrument used and is a reason for further investigation. The answer to the research question is, therefore, cautiously positive. This means that the combined model of Hagger *et al*. (ibid) potentially provides us with a more comprehensive explanation of teachers' volitional behavior regarding their use of DLMs in their pedagogical practices than would be possible if

only SDT or IMBP was used. In that respect, it is from our findings clear that attitude is a very important variable and that satisfaction of basic needs is required as to motivate teachers and to develop positive attitudes towards the use of DLMs.

To make Wikiwijs successful it seems obvious that governmental actions to promote the use of (open) DLMs by teachers should also take the promotion of autonomy, competence and relatedness of teachers into account and, thus, for example not only to provide ICT equipment. If math teachers refuse to use DLMs in their classes, then this may be due to negative attitudes toward the DLMs. An intervention should then be directed at changing these attitudes. A closer look may reveal that the negative attitudes are caused by the belief that the traditional approach to teaching math is "the proper way" to do it. The teachers' educational philosophy (distal variable at the individual level) underlies these beliefs. Consequently, changing this philosophy should be the purpose of the intervention. If, on the other hand, teachers perceive a lack of skills and knowledge (competency), then this would imply that self-efficacy and its antecedents are the most important concerns for intervening.

Future Research

The findings of our study inform us that our future research must take a closer look at the unexpected finding that self-efficacy is hardly contributing to the explanation of the variance in intention in this model. Previous research has demonstrated that the relative contributions of the three dispositional variables attitude, subjective norm, and self-efficacy may vary across different situations "[i]t is … expected that the components making up the factor structure of the … proposed model, known as the measurement aspects, will be similar in [different] behavioral contexts, the model constructs, known as the structural components, may vary across contexts" (Hagger *et al*. ibid, p. 137). Although previous research may have found this argument as a possible explanation why in some cases the relative contribution of self-efficacy is low, it cannot fully explain why in the present study this contribution is almost 'zero.' Especially we will go more looking carefully at existing instruments and where necessary designing new ones, based

on the three principles of specificity, TACT and context. This implies defining the ICT behavior as specific as possible; for example using digital learning materials or using a digital student portfolio. It also means implementing the TACT principle, thus being specific about when, where, how often and in which context the target behavior takes place. Finally, including the principle of compatibility holds that our operationalization of the behavior dispositions should match the specification of the target behavior. Designing these new instruments is another step in our future research. Finally we will go more in depth regarding those variables that are supposed to mediate effects, for example, self-determined motivation (or RAI) is supposed to mediate the effects of psychological need satisfaction.

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Figure 1: IMBP for the domain for the advancement of the integration of ICT in teachers' pedagogical practices; in this study the usage of DLMs. Grey areas depict the variables of interest in this study.

Figure 2: The different types of motivation and regulations.
(adapted from Deci and Ryan, 2000)

Figure 3: SDT regarding the forming of self-determined motivation. Grey areas depict the variables of interest in this study.

Figure 4: Hagger's *et al*. model in which SDT and TPB (i.e., IMBP) are combined using Vallerand's hierarchical model of motivation.

Figure 5: Path diagram of Hagger's *et al*. (2006) model. The light grey arrow (relationship between self-determination motivation and subjective norm) represent a non-significant relationship. The dark grey arrow (relationship between self-efficacy and intention) represent a significant relationship where $p < .05$. All black arrows represent significant relationships where $p < .001$ whereas grey arrows represent non-significant relationships.